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ESTIMATES OF GENETIC AND PHENOTYPIC TRENDS CONSIDERING EARLY AND LIFETIME PERFORMANCE TRAITS IN MURRAH BUFFALOES

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ABSTRACT

Data on 479 Murrah buffaloes over a period of 24 years from 1990 to 2013 related to early and lifetime performance traits were collected from history sheets maintained at Buffalo Research Centre, LUVAS, Hisar. All the early performance traits had positive genetic trends that varied from 14.97±4.95 kg/period, 0.04±0.02 kg/period, 0.03±0.01 kg/period, 0.34±0.68 days/period and 1.83±1.06 days/period for FLMY, FPY, FLMY/FLL, FSP and FCI, respectively. The genetic trends for lifetime performance traits were found to be negative for LTMY, PL and HL traits while it was positive and very low for MY/PL and MY/HL. Positive genetic trends for FLMY, FPY and FLMY/FLL and negative phenotypic trends for FCI and FSP are in desirable direction. Moreover, negative genetic and phenotypic trends for LTMY, PL and HL are suggestive and indicator to streamline the breeding policy for attaining the desired genetic improvement for ameliorating the productive life as well as herd life there by taking care of LTMY.

KEYWORDS: Genetic Trend, Phenotypic Trend, Early and Lifetime Traits & Murrah Buffaloes.

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INTRODUCTION

Indian economy is, by and large, hover around livestock sector as the country possesses 14.34% world cattle population and 57.77% world buffalo population and occupies prime position with respect to milk production (FAO, 2015). Maximization of the genetic progress in economic characters remains the sole object of the dairy buffalo breeders. For determining the effect of selection in a population over the years it is necessary to know phenotypic and genetic trends. Estimation of genetic trends is necessary to monitor and evaluate selection programs. The estimates of trends in the performance traits of dairy cattle seem to vary from breed to breed and from herd to herd due to differences in locality, management and selection objectives (Amino *et al*. 2007). The genetic gain per unit of time is also required for making appropriate changes in the management practices and breeding policies. The phenotypic trends in the performance level of a herd per period comprises of environmental trends resulting from changing environmental conditions and genetic trends resulting from selection of animals. The partitioning of phenotypic trends into genetic and environmental trends is necessary for breeders to determine the effectiveness of selection and management status over the time. Monitoring of the genetic advancement helps us for designing the more appropriate breeding strategies to maximize the genetic gains. Literature is dotted with dotted with sparse and sporadic reports with regard to genetic and phenotypic trends (Kuralkar and Raheja, 1997; Bashir *et al.*, 2007 and Chakraborty and Dhaka, 2012). Therefore, in this study attempt was made to study phenotypic and genetic trends for early and lifetime performance traits, in Murrah buffaloes.

MATERIALS AND METHODS

Data on479 Murrah buffaloesprogeny of 101 series, pertaining to early performance traits were collected from history sheets maintained at Buffalo Research Centre (BRC), Department of Livestock Production Management, LUVAS, Hisar, over a period of 24 years from 1990 to 2013. Assuming that, there is not much variation in adjacent years, entire period of twenty four years was divided into six periods, each consisting of four consecutive years. Each year was further delineated into four seasons of calving according to the geo-climatic conditions in the area, viz., Summer (April to June), Monsoon (July to September), Autumn (October to November) and Winter (December to March). Early performance traits considered were: first lactation milk yield (FLMY), first peak milk yield (FPY), first lactation milk yield per day of first lactation length (FLMY/FLL), first service period (FSP) and first calving interval (FCI) as well as lifetime performance traits viz. lifetime milk yield (LTMY), productive life (PL), herd life (HL) and milk yield per day of productive life (MY/PL) and milk yield per day of her life (MY/HL). For lifetime traits, only those animals were included in the study that remained in the herd for at least three lactations and up to maximum of five lactations.

The genetic trends of different early and lifetime performance traits were estimated by taking regression of weighted average of sire's estimated breeding value (WAEBV) for each year on year. The WAEBV for the k^{th} year was calculated as follows:$\sum n_i k S_i/n$. k, Where,$n_i k$, number of daughters of sire i (i=1,2,3.4…….n) in year k; S_i, estimated breeding value of sire i and n. k, total no. of daughters of n sires in year k. While, Phenotypic trends for each trait was estimated as linear regression of performance of population on year, as per SAS (1997). The standard error for of linear regression, required for estimating phenotypic and genetic trends was estimated, as per the formula given by Falconer (1991). S. E. (b) = $\sqrt{}$ [{1 / (N-2)} {(σ^2 x / σ^2y) – b^2}] Where, N, number of period observations of x and y; σ^2y, variance of y; σ^2x, variance of x and b = regression coefficient of y on x.

RESULTS AND DISCUSSIONS

The results pertinent to genetic and phenotypic trends of early performance traits have been presented in Table 1 and 2, respectively. All the early performance traits had positive genetic trends that estimated as 14.97±4.95 kg/period, 0.04±0.02 kg/period, 0.03±0.01 kg/period, 0.34±0.68 days/period and 1.83±1.06 days/period for FLMY, FPY, FLMY/FLL, FSP and FCI, respectively. R^2 values for these traits are reasonably good ranging from 0.43 to 0.70 except that very low value for FSP. Kuralkar and Raheja (1997) reported positive genetic trends, for FLMY (16.09±4.19 kg/year), FCI (2.17±2.09 days/year). However, Chander (2002) reported low, negative genetic trends (-0.19±0.68) for FLMY and positive (1.39±2.39 days/year) for FCI. Furthermore, Chakraborty and Dhaka (2012) reported negative genetic trends for FLMY (-1.11 kg/year), low and negative for FPY (-0.004 kg/year), low and negative, for FLMY/FLL (-0.002 kg/year). While, Chaudhari (2009) reported negative genetic trends (-0.37±0.08 days/year) for FSP. The value of genetic trends for FCI were reported to be lower than reported, by Kuralkar and Raheja (1997), Chadha (1998) and Sahana and Sadana (1998).

The corresponding phenotypic trends for early performance traits were estimated to be high, positive and non-significant for FLMY (116.87±70.39 kg/period) and positive for FPY and FLMY/FLL (0.50±0.27 kg/period and 0.40±0.20 kg/period) while negative for FSP and FCI (-3.37±3.00 days/period and -8.73±4.29 days/period. R^2 values for these phenotypic trends are comparatively low compared to corresponding figures with genetic trends vis-à-vis early performance traits ranging from 0.24 to 0.51. The lower values for FLMY were reported by Kuralkar and Raheja (1997),

Chander (2002) and Ramos *et al.* (2006). Whereas, negative phenotypic trends for FPY and FLMY/LL, were reported by Chakraborty and Dhaka (2012). The value of FCI was low and negative, as reported by Sahana and Sadana (1998) and Chander (2002), in Murrah buffaloes. However, Kuralkar and Raheja (1997) reported higher value for FCI. The results of the study for early performance traits are in desirable direction indicating that, selection applied at livestock farm and policies employed is appreciable. However, low values of R^2 suggests that more data need to be included with large number of daughters per sires to drive a meaningful conclusion.

The results of genetic and phenotypic trends of lifetime performance traits have been presented in Table 3 and 4, respectively. The genetic trends for lifetime performance traits were found to be negative for LTMY, PL and HL (-42.09±111.45 kg/period, -3.04±3.24 days/period and -14.27±12.34 days/period) traits while was positive and very low for MY/PL and MY/HL (0.01±0.14 kg/period and 0.02±0.01 kg/period, respectively). However, R^2 values for genetic trends of lifetime performance traits are on lower side compared to the values for early performance traits and ranged from 0.16 to 0.36. Similarly, positive genetic trends were estimated, by Bashir *et al.* (2007) for LTMY, PL and HL in Nilli-Ravi buffalo.

While, corresponding phenotypic trends were comparatively low and negative for LTMY, PL and HL (-80.98±156.15 kg/ period, -57.54±16.61 kg/period and -237.09±41.24 days/period), and low but positive for MY/PL and MY/HL (0.30±0.05 kg/period and 0.15±0.03 kg/period). However, Bashir *et al.* (2007) reported values of (-280 kg/year and -42 days/year) for LTMY and PL. When comparison of R^2 values for phenotypic trends of lifetime performance traits vis-à-vis genetic trends was made it revealed that, R^2 values were on the lower side for phenotypic trends and ranged from 0.05 to 0.15. Also, Settar and Weller (1999), reported corresponding value of (-93 days/year) for HL.

SUMMARY

Positive genetic trends for FLMY, FPY and FLMY/FLL with reasonably good R^2 values ranging from 0.58 to 0.70and negative phenotypic trends for FCI and FSP with low R^2 values indicated that the breeding policies are in desirable direction. However, negative genetic and phenotypic trends for LTMY, PL and HL augment to reconsider breeding policy, for attaining the desired genetic improvement for ameliorating the productive life, as well as herd life there by taking care of LTMY. Estimates of genetic and phenotypic trends suggest framing suitable breeding strategies, for bringing desired genetic improvement. Low values of R^2 for genetic and phenotypic trends of early and lifetime performance traits suggest that, large data including more farms with large number of daughters, per sires be analyzed to have some conclusive directions.

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REFERENCES

1. *Amimo J. O., Wakhungu J. W., Inyangala B. O. and Mosi, R. O. (2007). The effects of non-genetic factors and estimation of genetic and phenotypic parameters and trends for milk yield in Ayrshire cattle in Kenya. Livestock Res. Rural Devvt.19: 1-9.*
2. *Bashir, M. K., Khan, M. S., Bhatti, S. A. and Iqbal, A. (2007). Lifetime performance traits of Nilli-Ravi buffaloes in Pakistan. Asian-Aust. J. Anim. Sci., 20: 661-668.*

3. *Chakraborty, D. and Dhaka, S. S. (2012). Estimation of genetic and phenotypic trends from production efficiency traits in Murrah buffaloes. Indian J. Anim. Res. 46: 410-412.*

4. *Chander, R. (2002). Prediction of the breeding value of sire's for life time performance traits in Murrah buffaloes. Ph. D. Thesis, Haryana Agricultural University.,Hisar.*

5. *Chadha, K. K. (1998). Analysis of breeding records of a buffalo herd. Ph. D. Thesis, Punjab Agric. Univ., Ludhiana, Panjab, India.*

6. *Chaudhari, M. (2009). Estimation of genetic and phenotypic trends for economic trends in Sahiwal cattle. M. V. Sc. thesis, Haryana Agricultural University, Hisar, India.*

7. *Falconer, D. S. (1991). Introduction to Quantitative Genetics. Third edition. ELBS Publication. U. K.*

8. *FAO, 2015.www.fao.org/stat 2015.*

9. *Harvey W R. (1990). User's Guide for LSMLMW, Mixed Model Least-Squares and Maximum Likelihood Computer Programme. Ohio State University. Columbus.Mimeo.*

10. *Kuralkar, S. V. and Raheja, K. L. (1997). Estimation of genetic and phenotypic trends for first lactation traits in Murrah Buffaloes. Indian J. Anim. Sci. 67: 695-697.*

11. *Ramos, A. A., Malhado, C. H. M. and Carneiro, P. L. S. (2006). Phenotypic and genetic characterization of milk yield and calving interval in buffaloes of the Murrah breed. Pesq. Agropec. Bras, 41:1261-1267.*

12. *Sahana, G. and Sadana, D. H. (1998). Evaluation of production performances of Murrah buffaloes. Indian J. DairySci. 51: 115-120.*

13. *SAS (1997). User's Guide: Statistics, Version 6.12 Edition. SAS institute Inc., Cary, NC, USA.*

14. *Settar P. and Weller J. I. (1999). Genetic Analysis of Cow Survival in the Israeli Dairy Cattle Population. J Dairy Sci., 82: 2170-71.*

Table 1: Genetic Trends Based on Period-Wise Average of the early Performance Traits

S. No	Traits	Intercept (Mean±S. E)	Period (Mean±S. E)	R^2 value
1	FLMY	2021.99±19.26	14.97±4.95	0.70
2	FPY	9.92±0.07	0.04±0.02	0.58
3	FLMY/LL	6.64±0.04	0.03±0.01	0.61
4	FSP	152.71±2.66	0.34±0.68	0.06
5	FCI	471.58±4.11	1.83±1.06	0.43

Table 2: Phenotypic Trends Based on Period-Wise Averages of Early Performance Traits

S. No	Traits	Intercept (Mean±S. E)	Period (Mean±S. E)	R^2 value
1	FLMY	1676.44±274.14	116.87±70.39	0.41
2	FPY	8.26±1.	0.50±0.27	0.47
3	FLMY/FLL	5.31±0.7	0.40±0.20	0.50
4	FSP	165.51±11.69	-3.37±3.00	0.24
5	FCI	505.97±16.71	-8.73±4.29	0.51

Table 3: Genetic Trends Based on Period-Wise Averages of Lifetime Performance Traits

S. No	Traits	Intercept (Mean ± S. E)	Period (Mean ± S. E)	R^2 value
1	LTMY	6984.84±384.28	-42.09±111.45	0.16

2	PL	1009.90±26.59	-3.04±3.24	0.23
3	MY/PL	4.60±0.04	0.01±0.14	0.35
4	HL	3808.31±60.33	-14.27±12.34	0.25
5	MY/HL	1.90±0.03	0.02±0.01	0.36

Table 4: Phenotypic Trends Based on Period-Wise Averages of Lifetime Performance Traits

S. No	Traits	Intercept (Mean ± S. E)	Period (Mean ± S. E)	R^2 value
1	LTMY	8800.65±564.96	-80.98±156.15	0.10
2	PL	1347.41±60.09	-57.54±16.61	0.05
3	MY/PL	4.44±0.17	0.30±0.05	0.15
4	HL	4076.01±149.20	-237.09±41.24	0.13
5	MY/HL	2.07±0.11	0.15±0.03	0.10